

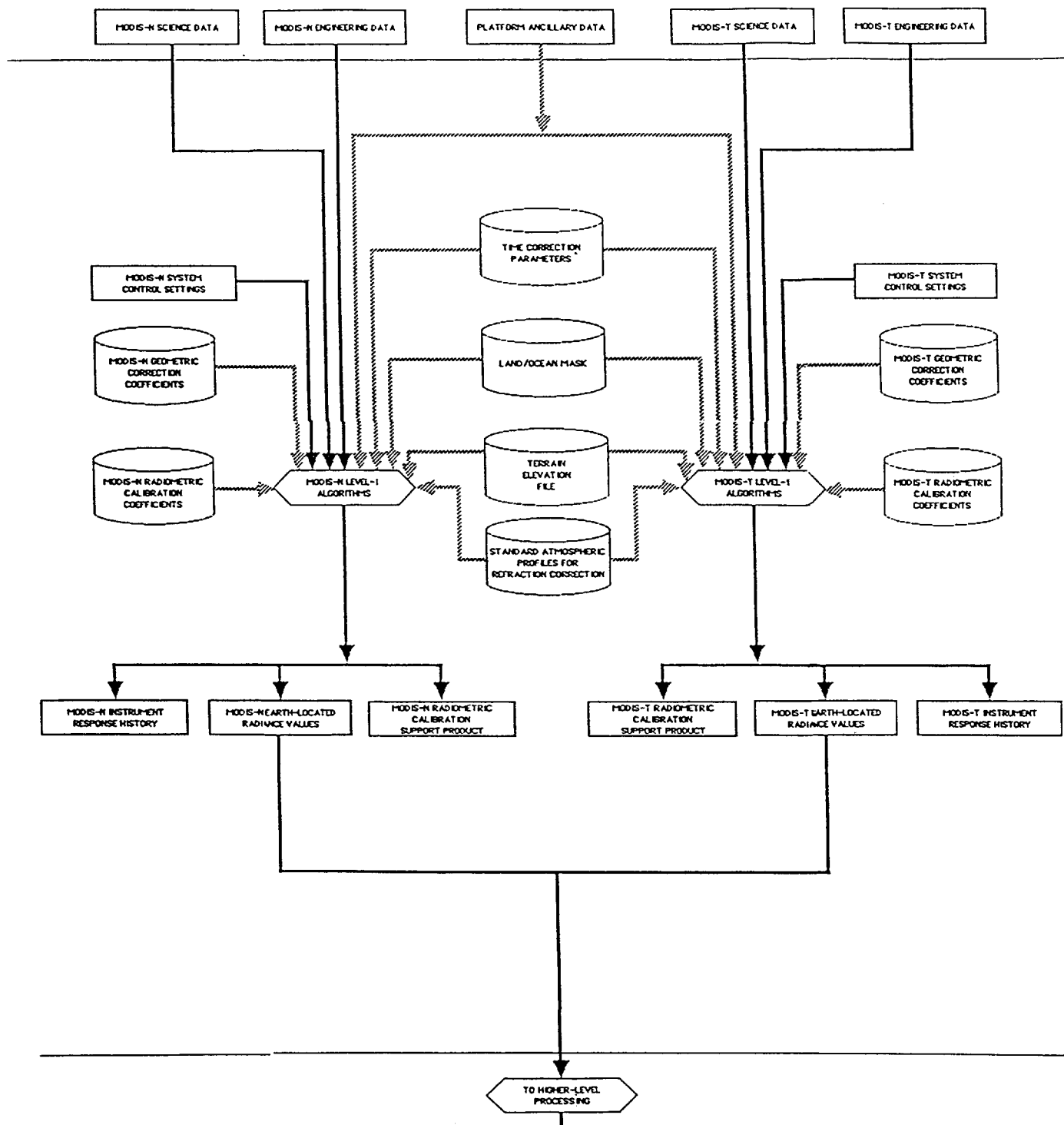
# **MODIS DATA STUDY TEAM PRESENTATION**

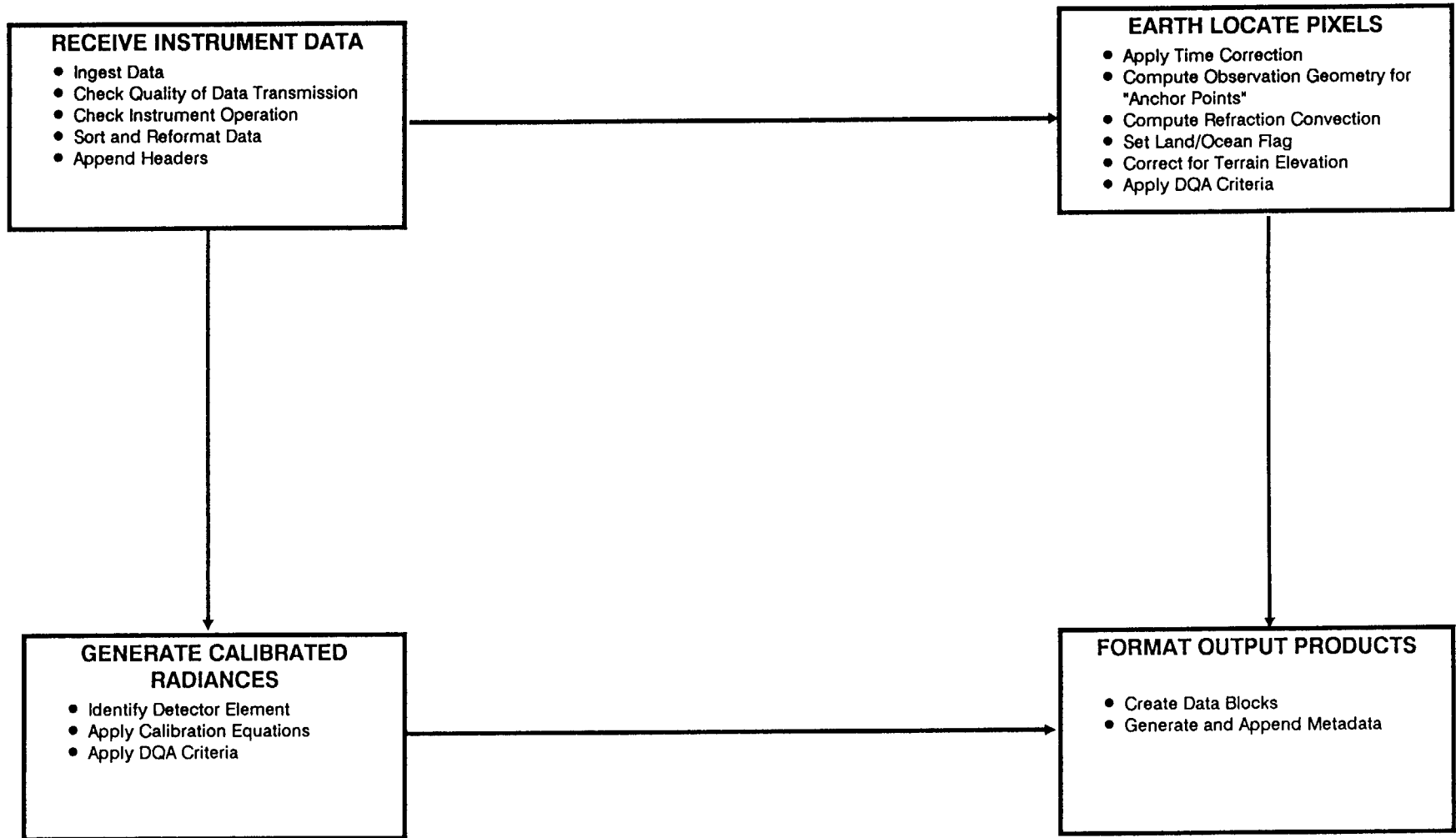
**May 26, 1989**

## **AGENDA**

1. MODIS Level-1 Processing Context Diagram
2. MODIS Level-1 Processing Functional Allocations
3. MODIS Level-1 Processing Interface Control Summary
4. Revised MODIS Core Data Products and Associated Data Flows
5. Revised List of MODIS Team Members and Supporting Staff Interested in Calibration

# MODIS Level-1 Processing Context Diagram





**Level-1 Processing Functional Allocations**

## MODIS LEVEL-1 PROCESSING INTERFACE CONTROL SUMMARY

Information from many sources is required to process MODIS data from Level-0 to Level-1 and Interface Control Documents (ICDs) will be needed to provide configuration control for the process. An ICD identifies and defines data and messages sent electronically or by other means between two interfacing elements. It also associates a requirement with each data flow item across the interface. The information contained in an ICD provides the detailed definition of interfaces and serves as a basis for implementing and testing the interface design.

A preliminary summary of ICDs that may be required to meet MODIS Level-1 processing requirements was compiled. This compilation outlines the possible content of the identified ICDs. Interfaces which will provide required data and information have been previously identified in the MODIS requirements document, EosDIS interface documents, and the EosDIS/MODIS interface comparison document. MODIS Level-0 data, as well as other data, messages, and instructions which are required for Level-1 processing are briefly summarized for each identified ICD. While many ICDs document an agreement between interfacing facilities, the ICDs proposed below are between a 'process' and a unique element of EosDIS. They may need to be expanded into a NASA configuration standard.

Critical and common components of these ICDs are outlined below. Critical components are those which should be identified and agreed to by each interface source. Common components are those which routinely apply to all interfaces.

The interfaces and ICDs identified thus far for Level-1 processing are:

- Level-1 / Level-0, DHC Interface
- Level-1 / Ancillary Data, DHC Interface
- Level-1 / ICC Interface
- Level-1 / Field Experiment, TMCF Interface
- Level-1 / IST/ICT Interface

Other possible ICDs which would have an impact on these Level-1 interfaces and processing requirements are;

- DHC / NASCOM Interface
- EosDIS / CDOS Interface
- CDHF (MODIS) / IMC Interface
- CDHF (MODIS) / DADS

## 1. ICD Critical Components

Critical components of identified ICDs are listed below.

### A. Level-1 / Level-0, DHC Interface

#### DHC Level-0 Data

- Data Content; MODIS science data, engineering data, and other ancillary data embedded in the science data packets that are level-0 processed by the DHC and any messages/responses with respect to this process.
- Physical Data Description - description of the Level-0 data packets
- Data Format - Packet format, e.g. CCSDS standard
- Data and/or message Syntax
- Data Rates and Volume - Expected transmission data rates (A Level1/NASCOM ICD may need to cover this topic)
- Data Schedules and timelines for transmittal of data to CDHF

### B. Level-1 / Ancillary Data, DHC Interface

#### DHC Ancillary data

- Data Content; Platform ancillary data downlinked in separate data packets that are level-0 processed by the DHC, refined and/or repaired by the Flight Dynamics Facility, and any messages and responses with respect to this data flow.
- Data Storage and Access; Ancillary data storage management and access.
- Physical Data Description; Description of the ancillary data
- Data Format; Packet format
- Data and/or message Syntax
- Data Rates and Volume; Ancillary data volume dependent ( A NASCOM related ICD?)

### C. Level-1 / ICC Interface

#### ICC Mission Planning information

- Information Content; Mission Planning Information Messages
- Physical Data Description
- Message Syntax and Format; Receipt and response
- Message Rates and scheduling timeline

### D. Level-1 / Field Experiment, TMCf Interface

#### Field Experiment Data

- Data Content; Level-1 Processed science data (calibrated and Earth located radiances, engineering history data, and Data quality flags).
- Physical Data Description; Description of Level-1 processed data
- Data and Message Format; Standard or 'personalized' formats
- Data and/or message Syntax; Covering requests and queries
- Data Rates and Volume

### E. Level-1 / IST(ICT?) Interface

#### IST(ICT) Calibration / Coefficient data

- Data Content; Updated and/or upgraded calibration coefficients, Level-1 processing algorithms, updates to files.
- Physical Data Description
- Data Format; Formats of data updates/upgrades
- Data and/or message Syntax
- Data Rates and Volume

## 2. Common ICD components

Common components of identified ICDs are listed below

### A. Interface Descriptions and Data Flows

### B. Functional Description of Interface Source

- DHC Level-0 Processing
- DHC Ancillary data processing
- ICC Planning and Scheduling
- Team Member Field Experiments
- Instrument Calibration

C. Electronic Links

- Electronic Network Capabilities and Growth
- Link Control - the logical sequence of messages
- Network Control - provides end point control across several link control areas

D. Protocols

- Standard messages for hand shaking between systems, networks, etc.

## REVISED LIST OF CORE MODIS DATA PRODUCTS

### CORE TERRESTRIAL DATA PRODUCTS:

- Normalized Difference Vegetation Indices
- Polarized Vegetation Indices
- Surface Snowcover
- Seasonal Land-cover
- Land-leaving Radiances (Bidirectional, spectral radiance at surface)
- Surface Effective Blackbody Temperature
- Surface Bidirectional Reflectance

### CORE OCEAN DATA PRODUCTS:

- Sea Surface Temperature
- Sea Ice Coverage
- Water Leaving Radiances
- Chlorophyll Fluorescence
- Chlorophyll-a Concentration
- Non-phytoplankton Absorptivity
- Detached Coccolith Concentration
- Surface Incident Photosynthetically Active Radiation (PAR)
- Attenuation at 490 nm ( $K_{490}$ )
- Attenuation of PAR ( $K_{PAR}$ )
- Primary Productivity

### CORE ATMOSPHERIC DATA PRODUCTS

- Total Column Ozone
- Aerosol Optical Depth
- Aerosol Mass Loading
- Polarization over the Oceans
- Aerosol Single Scattering Albedo

### CORE CLOUD DATA PRODUCTS

- Cloud Fractional Area
- Cloud Area and Perimeter
- Cloud Spectral Albedo and Brightness
- Cloud Optical Thickness
- Cloud Top Pressure
- Cloud Top Temperature
- Cloud Water Thermodynamic Phase
- Cloud Droplet Effective Radius

## LEVEL-0 DATA PRODUCTS

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## LEVEL-1 DATA PRODUCTS

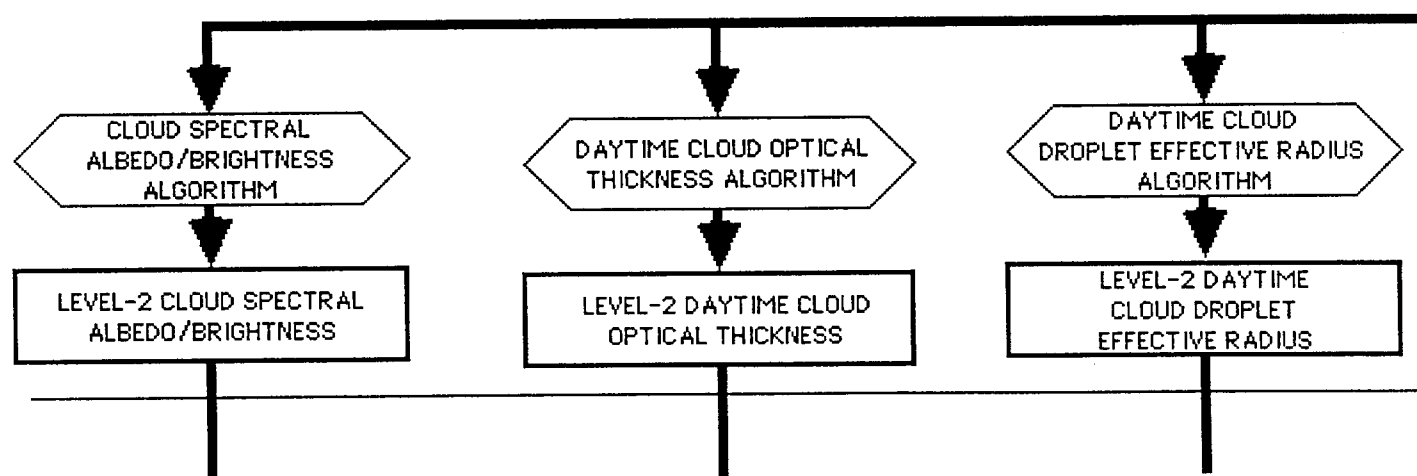
## LEVEL-2 DATA PRODUCTS

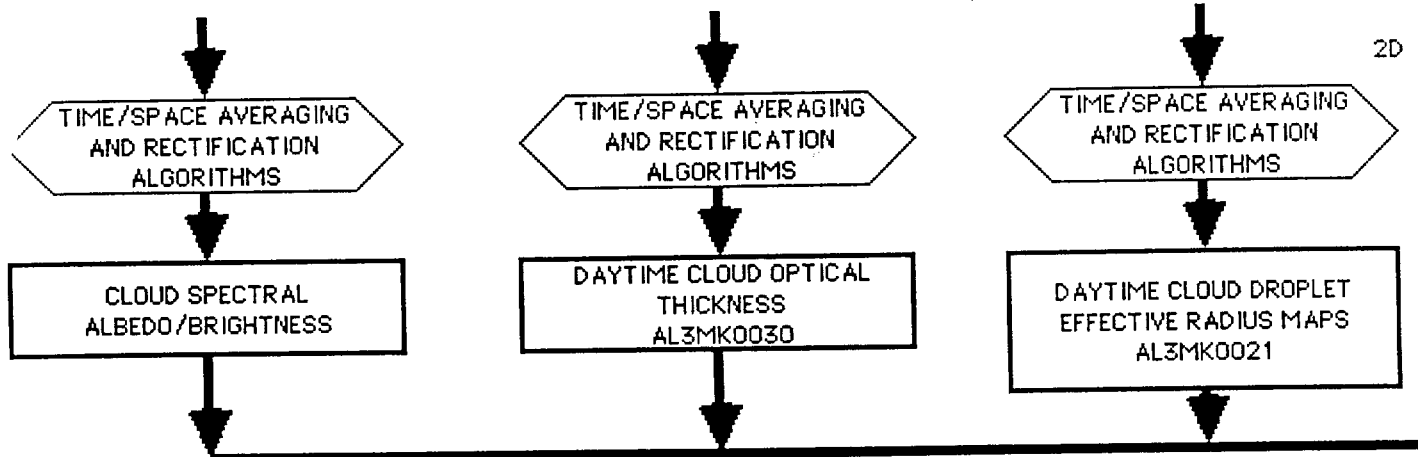
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## LEVEL-3/4 DATA PRODUCTS

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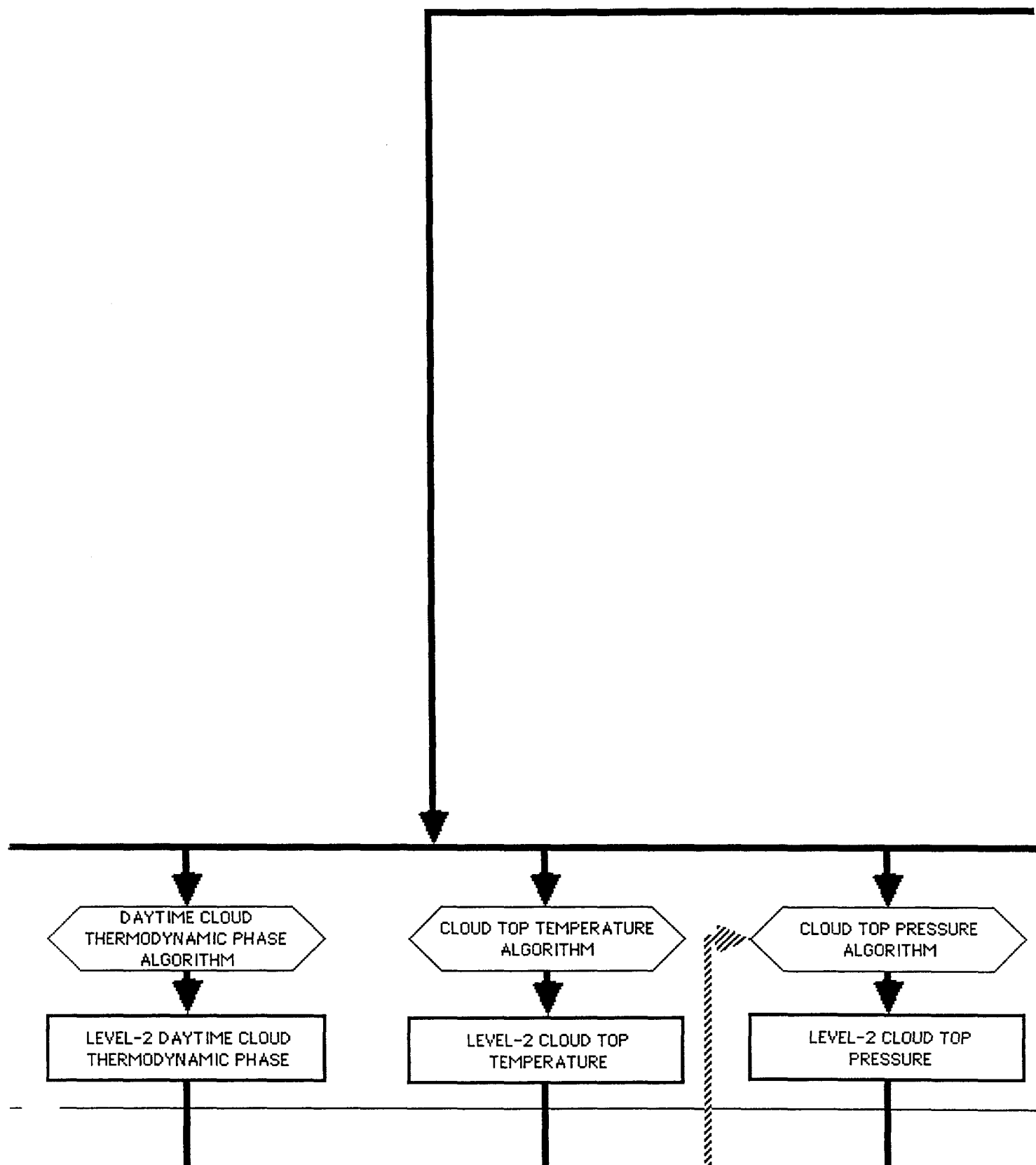
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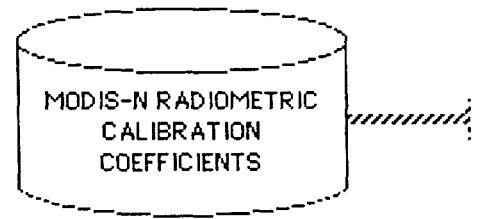


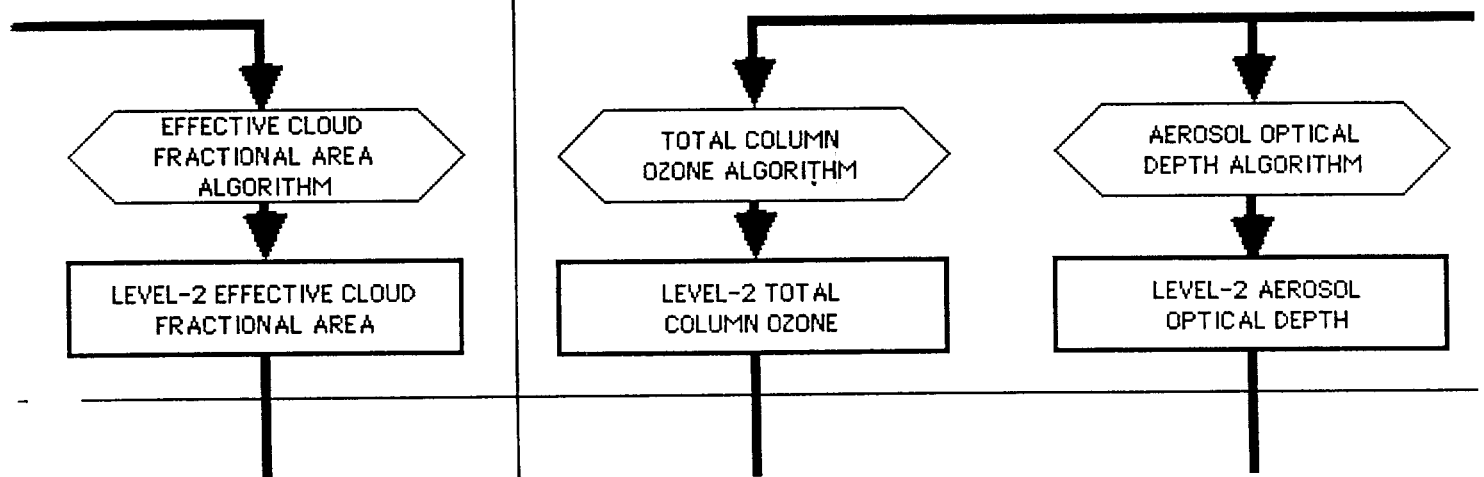
# CANDIDATE MODIS COR

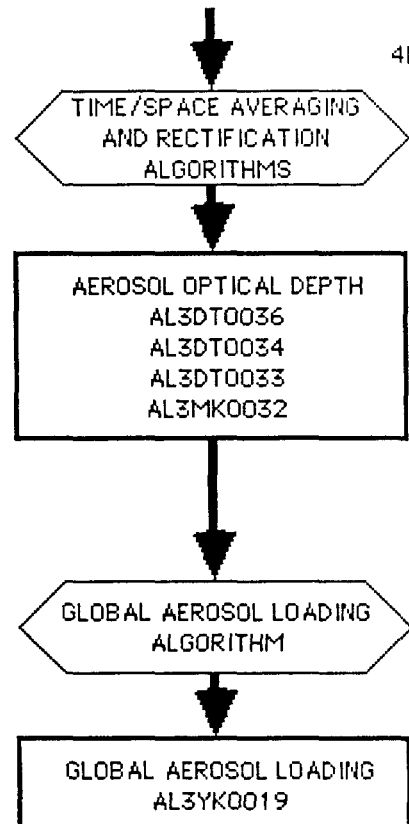
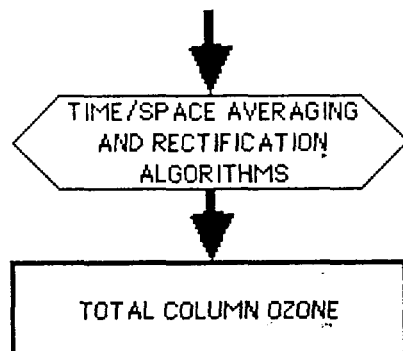
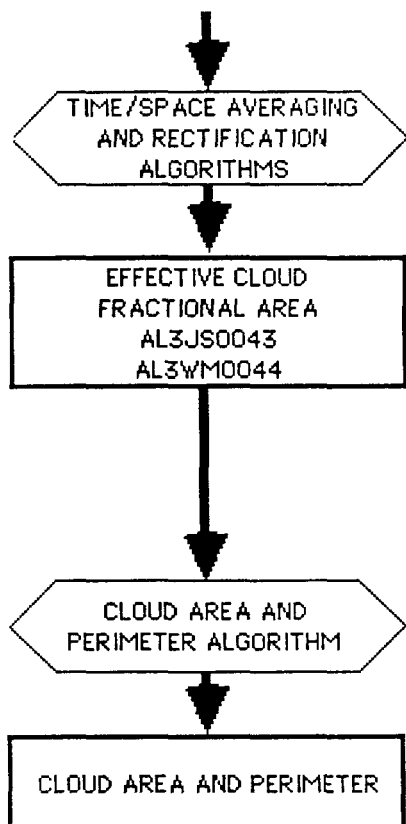
MODIS-N SCIENCE DATA

MODIS-N SYSTEM  
CONTROL SETTINGS

MODIS-N GEOMETRIC  
CORRECTION  
COEFFICIENTS



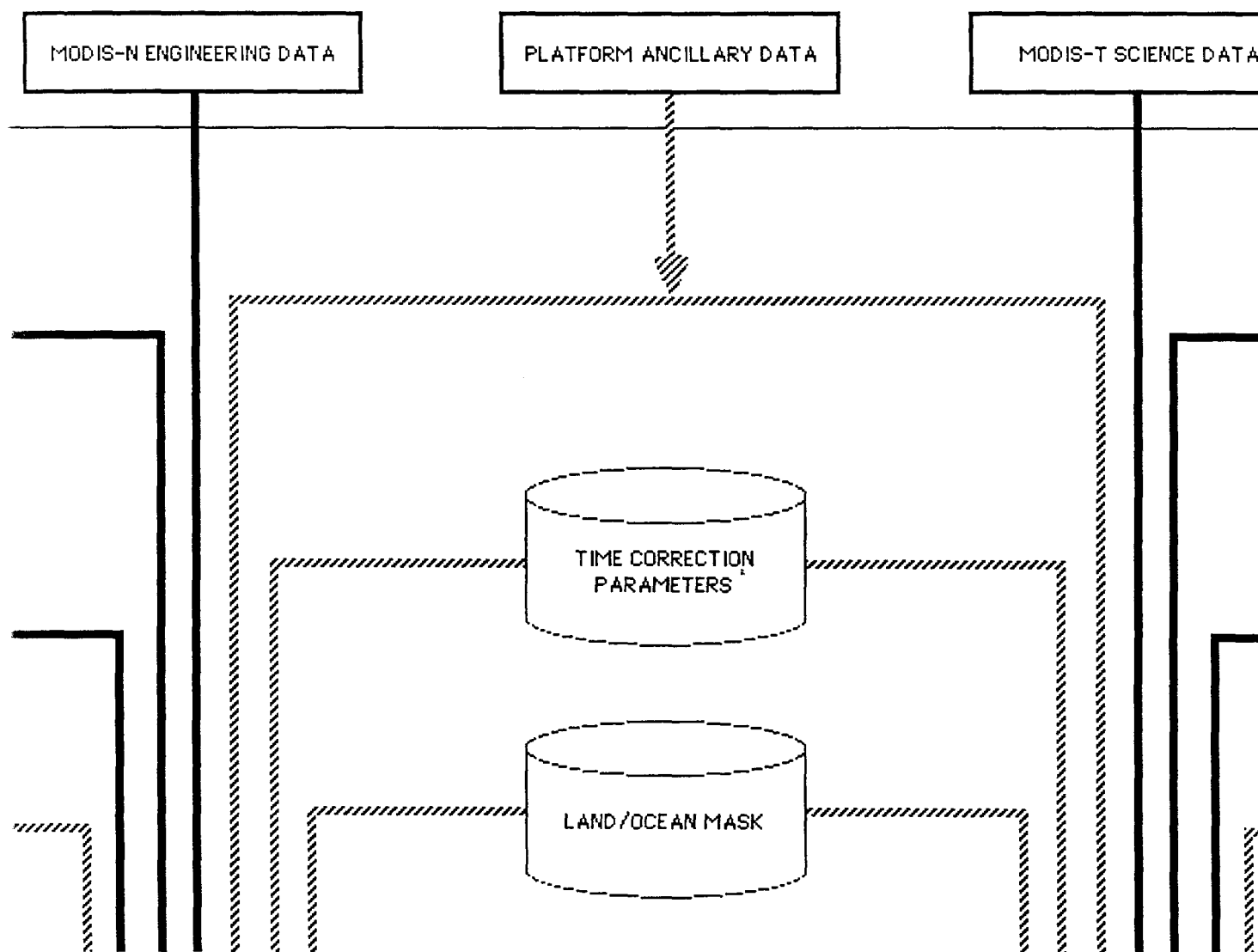


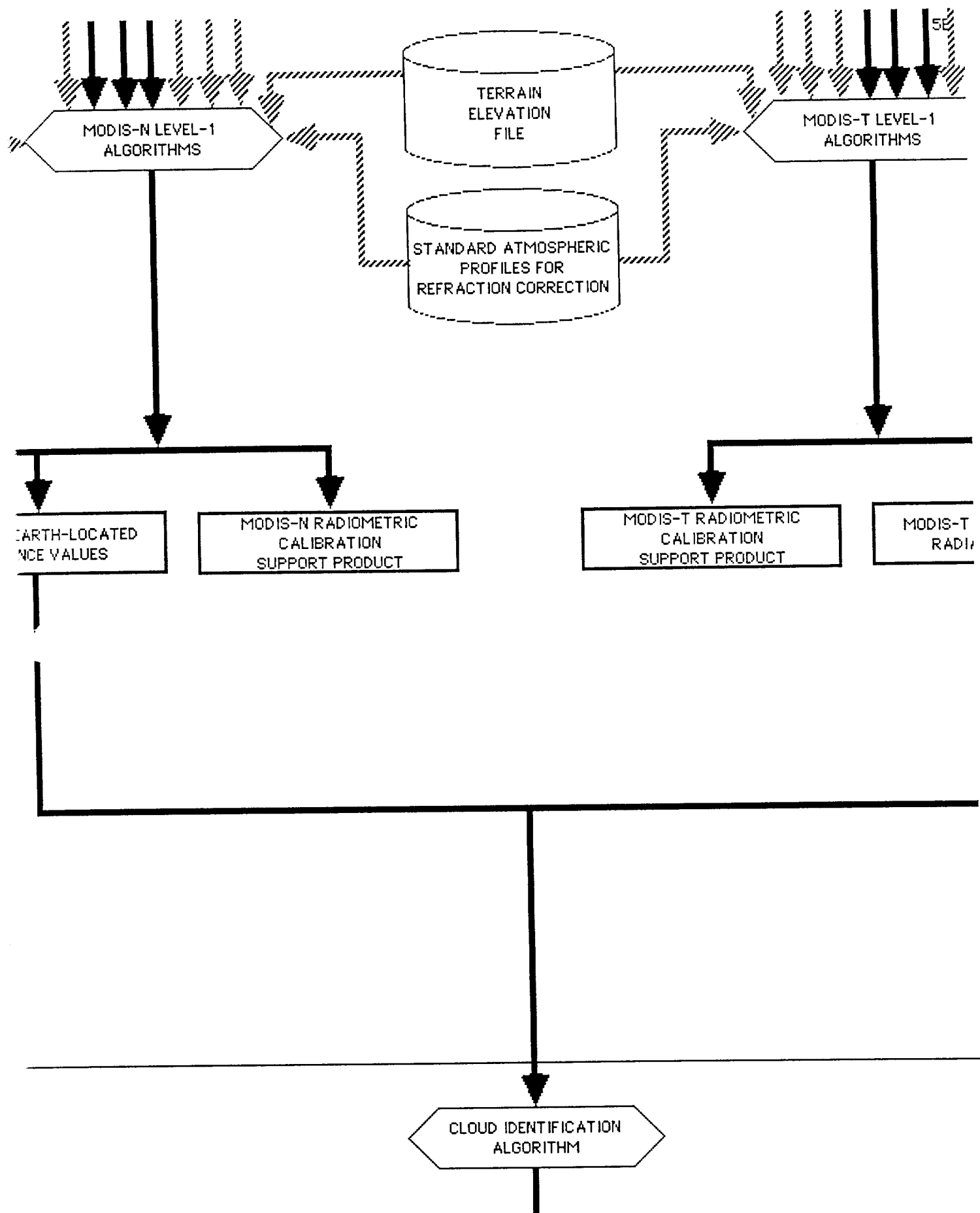


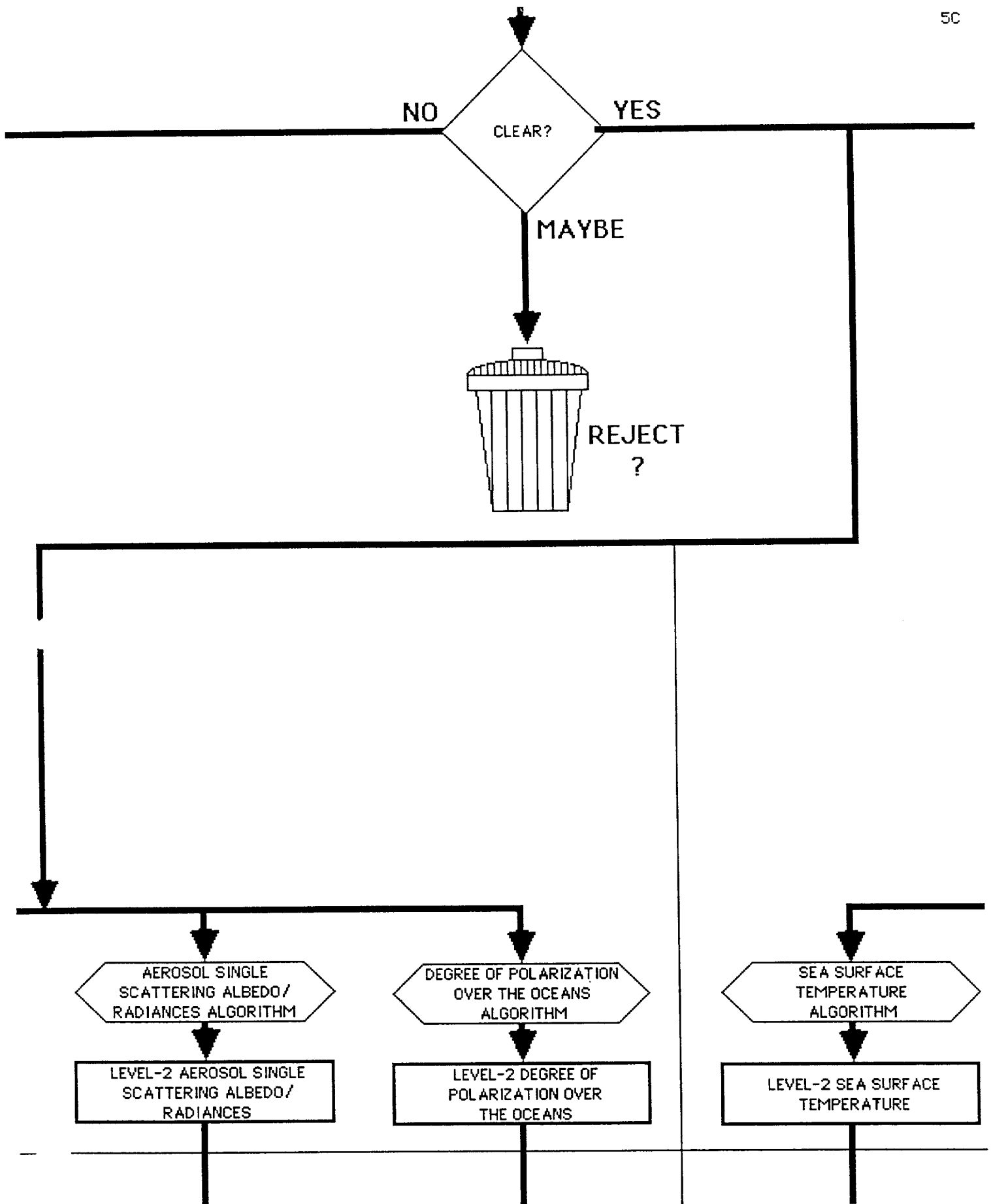
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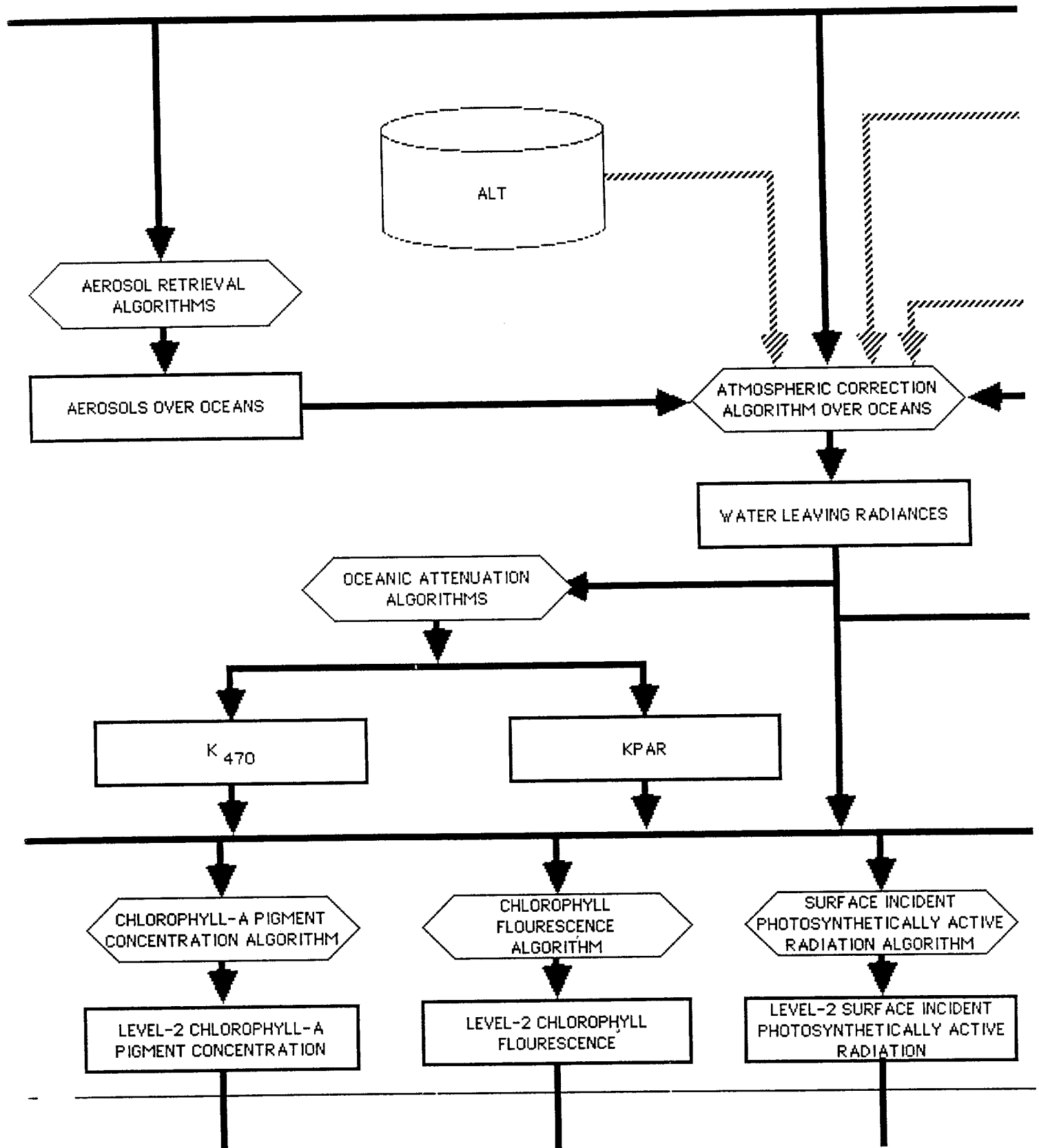
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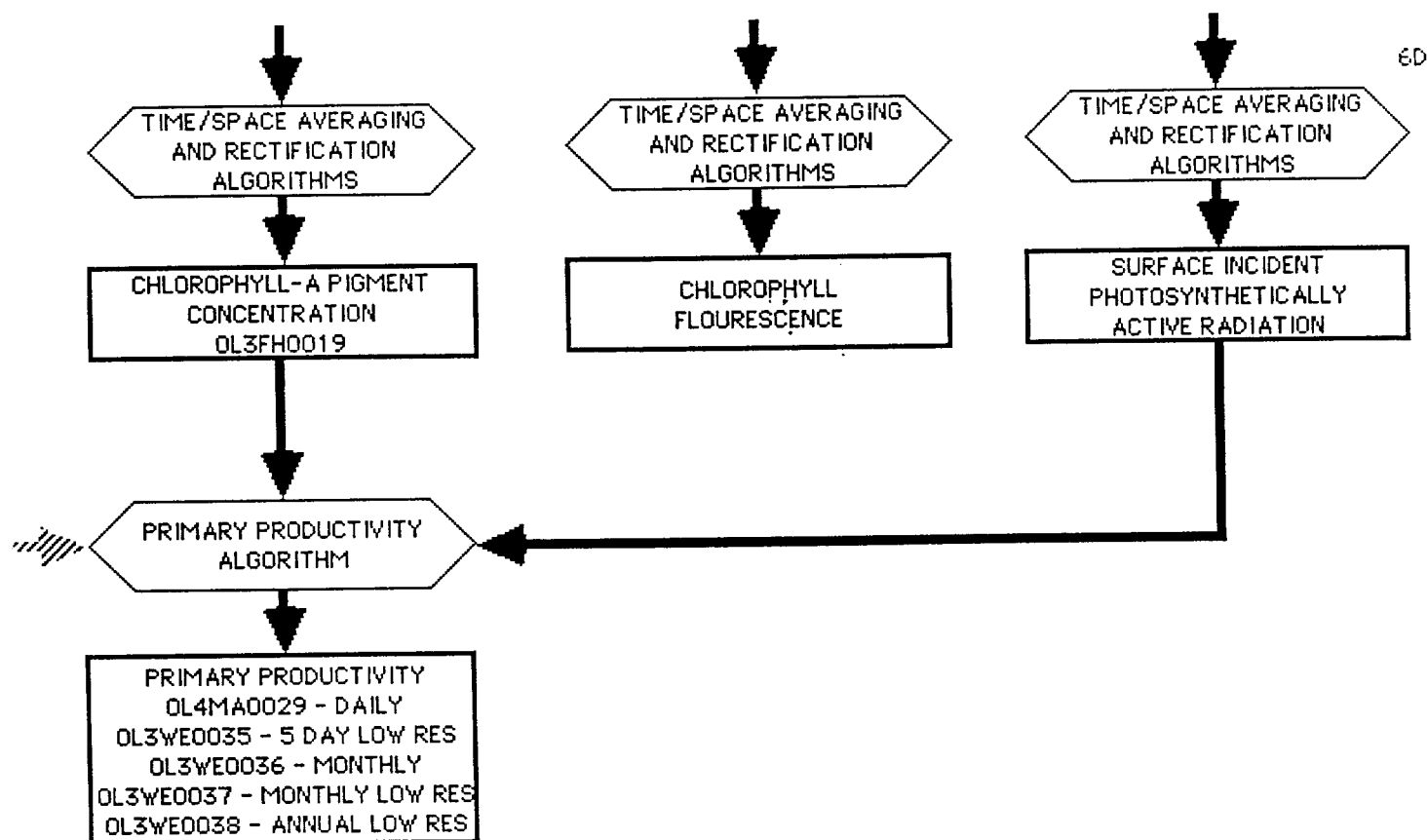
# E DATA PRODUCTS AND P









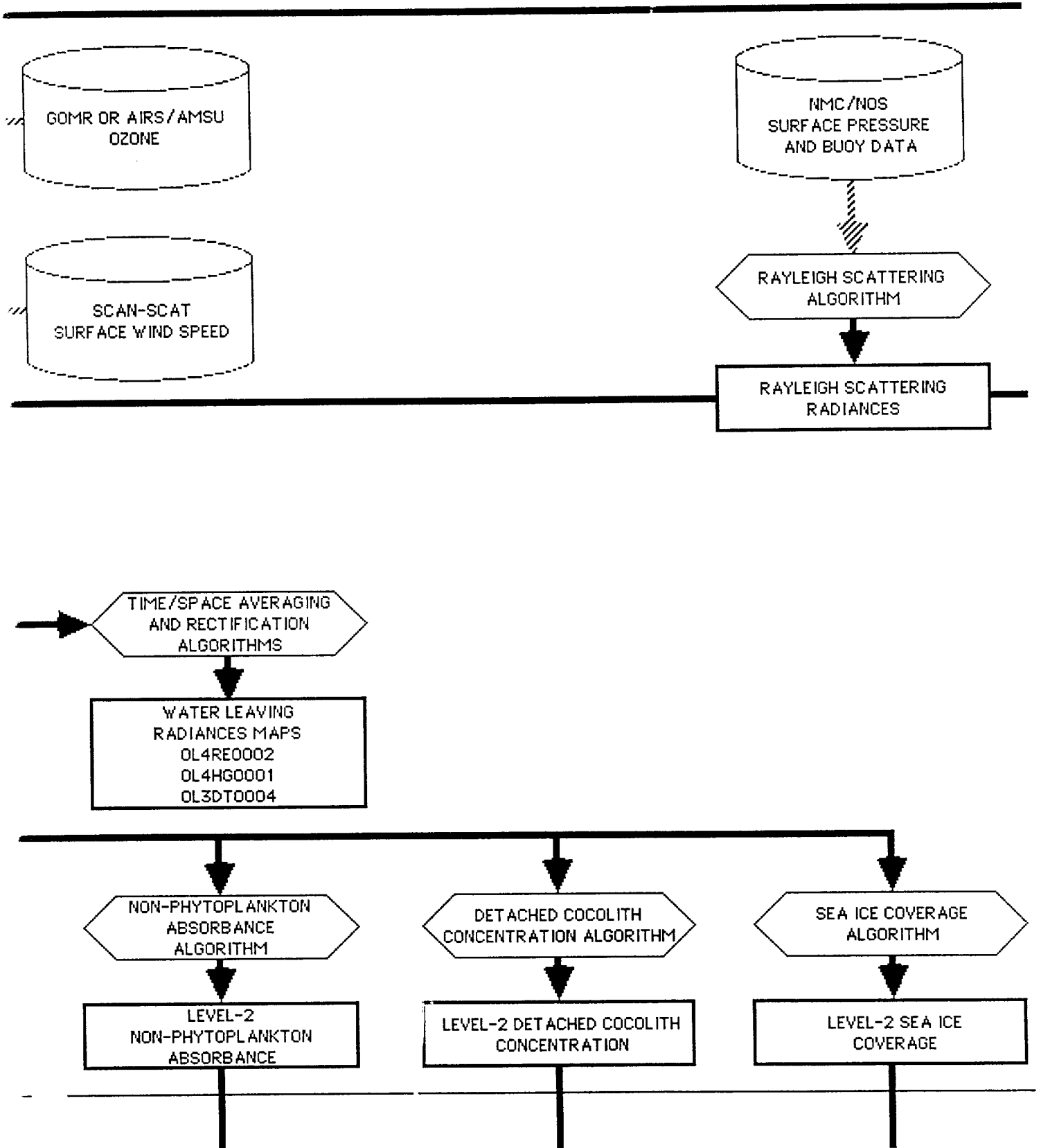


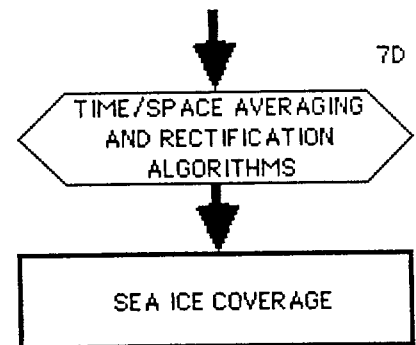
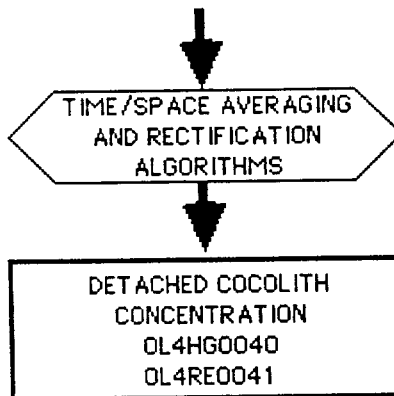
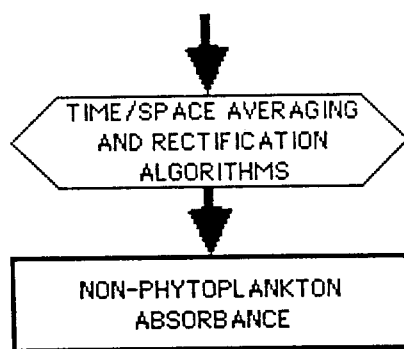
**OCEAN DATA PRODUCTS**

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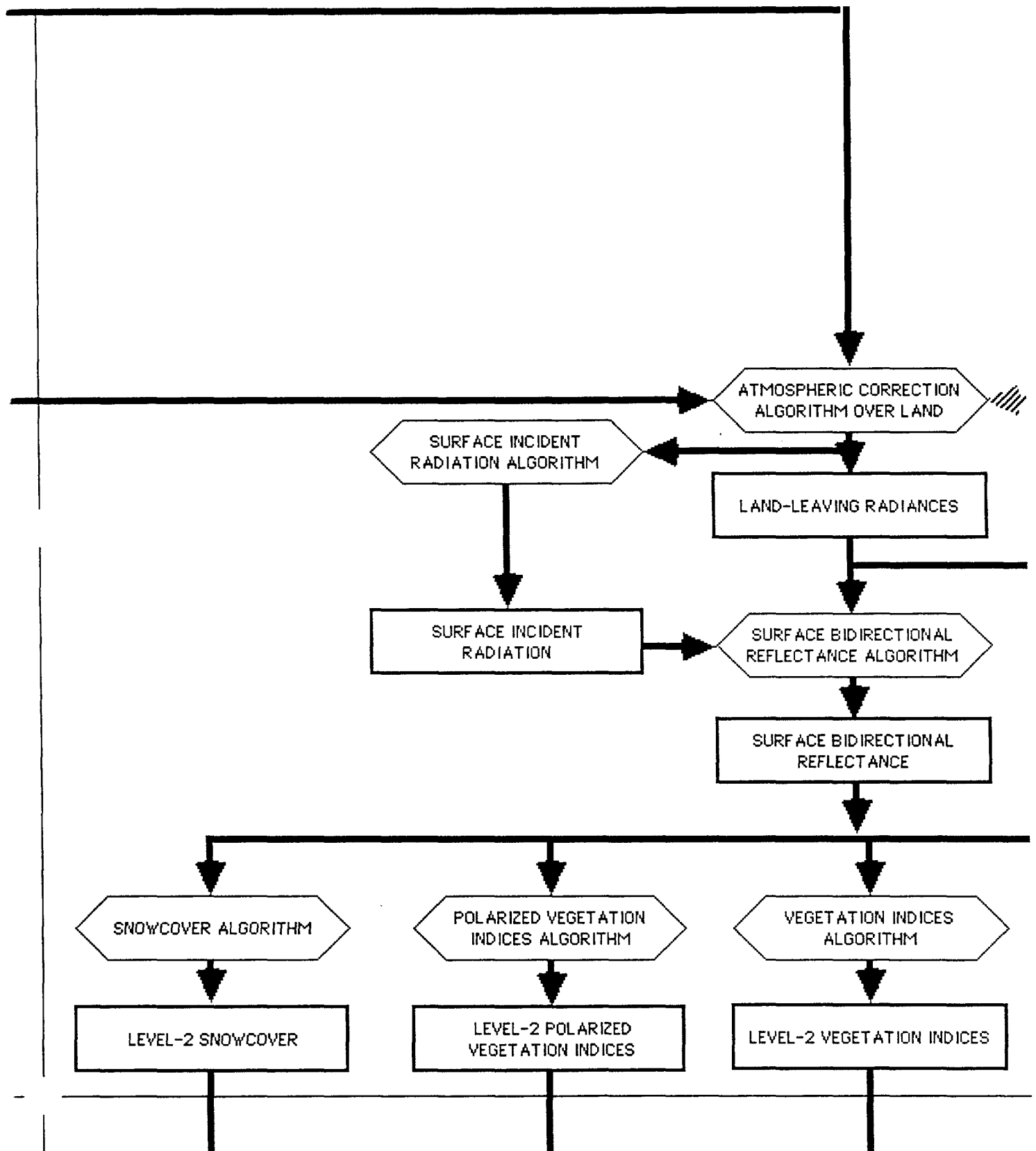
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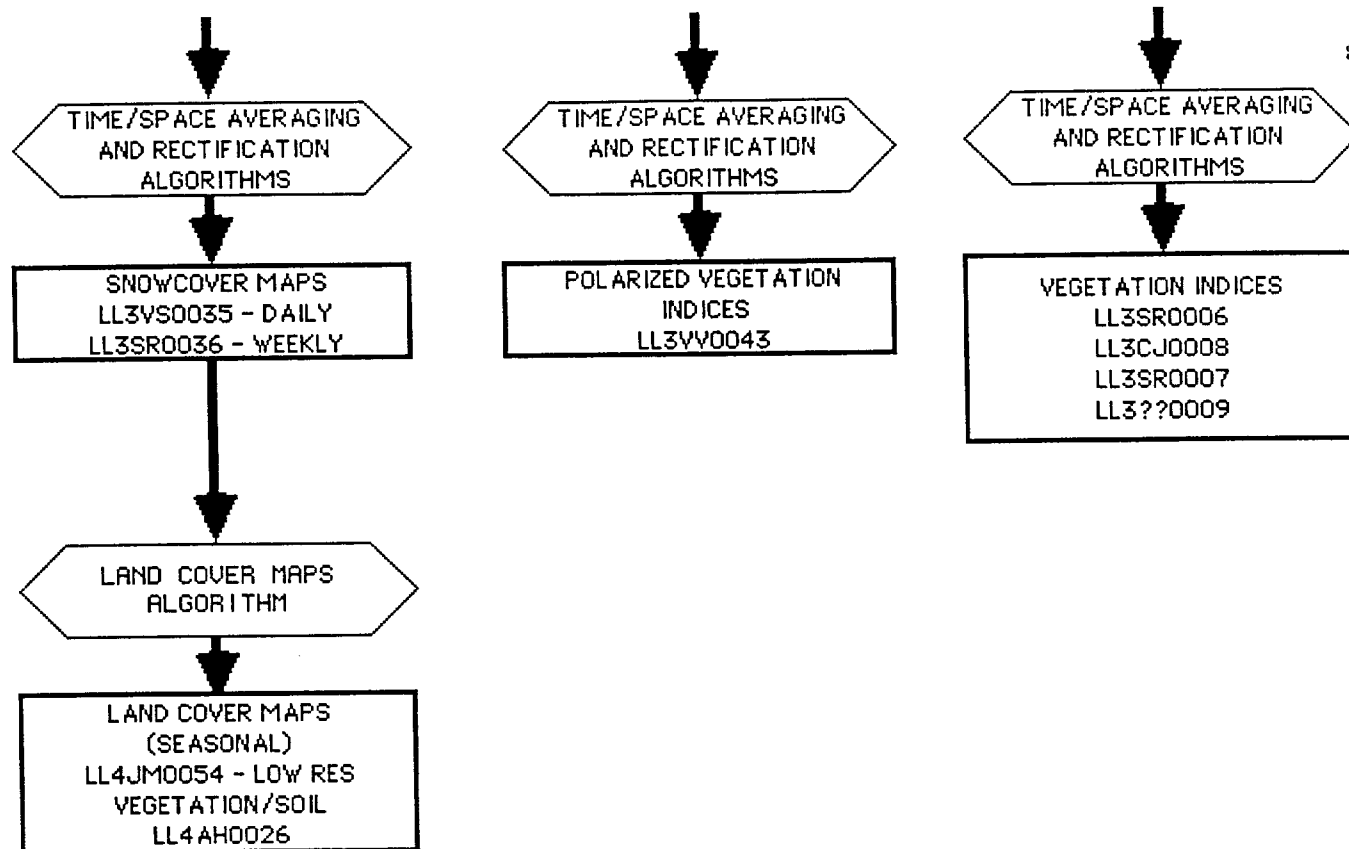






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# LAND DATA PRODUCTS

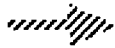
# KEY



DATA TYPE SEPARATOR



MODIS DATA FLOW LINES



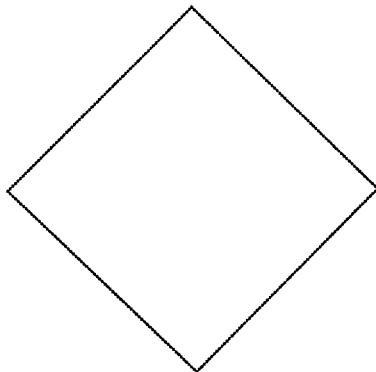
NON-MODIS DATA FLOW LINES



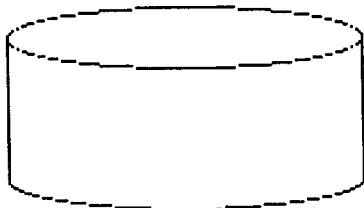
CORE MODIS DATA PRODUCTS



MODIS ALGORITHMS

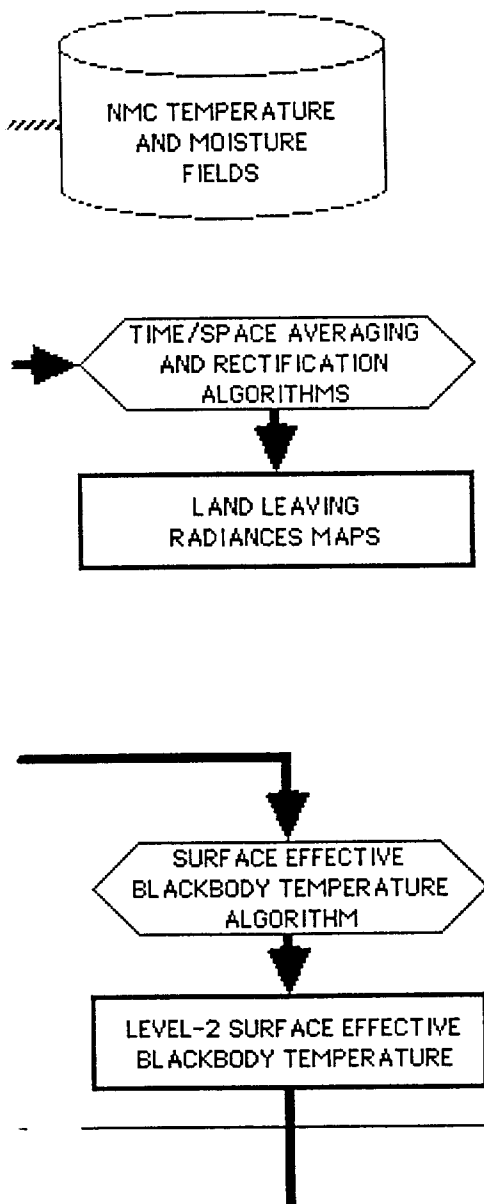


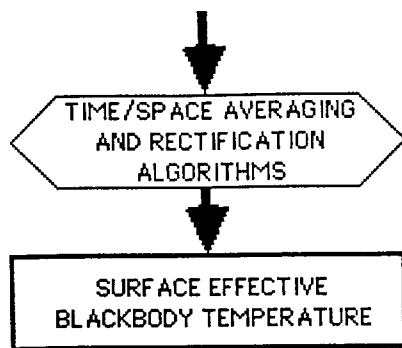
DECISION



NON-MODIS DATA

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## **FURTHER PROPOSED CHANGES**

1. EXPAND HIGH-LEVEL (L2-L4) ALGORITHMS TO SHOW TRUE DEPENDENCIES FOR ALL PRODUCTS
2. ACCURATELY DEPICT WHERE CLOUD IDENTIFICATION AND ATMOSPHERIC CORRECTION WILL OCCUR
3. CHANGE LAYOUT SO THAT CLOUD AND AEROSOL PRODUCTS APPEAR HIGHER IN THE FLOW CHART THAN OCEAN AND LAND PRODUCTS
4. DEFINE A NEW SHAPE FOR NON-MODIS, EOS DATA

LIST OF MODIS TEAM MEMBERS AND SUPPORTING STAFF  
INTERESTED IN CALIBRATION (5/22/89)

1) Dr. Vincent Salomonson/GSFC Code 620

Dr. Salomonson is interested in calibration of all the MODIS-N and T channels using in-flight sources, Earth calibration targets, the moon, pre-flight data, and any other means. Support staff for this purpose are:

- a) Bruce Guenther/GSFC Code 673
- b) John Barker/GSFC Code 625
- c) Brian Markham/GSFC Code 623

2) Dr. Philip Slater/U. of Ariz.

Dr. Slater is interested in calibration of all the MODIS-N and T channels using in-flight sources, Earth calibration targets, the moon, pre-flight data, an astronaut transported calibration unit (ATCU), and any other means. Support staff for this purpose are:

- a) J. M. Palmer/U. of Ariz.
- b) R. D. Jackson/Dept. of Agriculture
- c) M. S. Moran/Dept. of Agriculture
- d) D. I. Gellman/U. of Ariz.
- e) B. M. Herman/U. of Ariz. field observations
- f) J. A. Reagan/U. of Ariz. field observations
- g) D. Ream/White Sands Missile Range liaison
- h) G. Vane/JPL: AVIRIS and Edwards AFB liaison
- i) W. Tibbits/JPL?: AVIRIS and Edwards AFB liaison
- j) L. Tinney/EG&G aircraft scanners
- k) L. Balick/EG&G aircraft scanners

3) Dr. W. Paul Menzel/U. of Wisc.

Dr. Menzel is interested in the calibration of the 15 thermal channels on MODIS-N. Support for this activity will be provided by Tim Schmit/U. of Wisc.

4) Dr. Otis Brown/U. of Miami

Dr. Brown is interested in the calibration of channels 26, 27, 28, 30, 33, 34, and 35 of MODIS-N.

5) Dr. Robert Evans/U. of Miami

Dr. Evans is interested in calibrating all channels on MODIS-T and the visible channels on MODIS-N using the diffuser plate and the moon as sources.

6) Dr. Yoram Kaufman/Science Systems and Applications, Inc.

Dr. Kaufman is interested in comparing the calibration of the blue-green channels of MODIS-T/N with the sun glint as a calibration target, and comparing the visible channels with deserts as calibration targets and with the ocean as a dark source such as done by Fraser and Kaufman.

7) Dr. John Parslow/CSIRO Div. of Fisheries

Dr. Parslow is interested in the calibration of some of the MODIS-T channels using internal calibration sources and the moon.